

On the High Mountain Isopoda Oniscidea in the Old World

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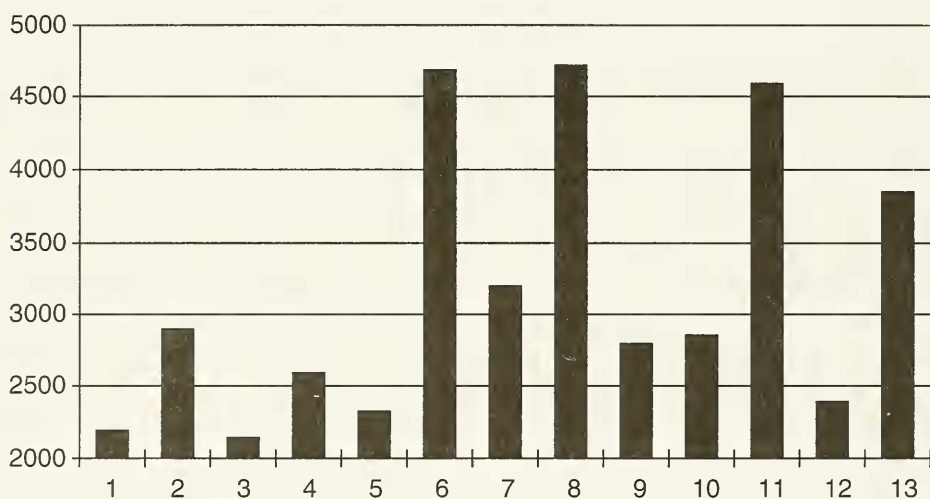
The land Isopoda are relatively rare in high altitude. Only 132 species (as far as we know) have been recorded from places higher than 2200 m. Here under „Old World“ we understand Europe, Africa (with the surrounding islands) and Asia (including Melanesia). Excluded are Australia, New Zealand, North and South America. The terms „high mountain environment“ and „high mountain fauna“ are defined by MANI (1968, p.8) considering mainly the Insects, but the other land Arthropods could be included too: „Considered from the point of view of ecology, biogeography and evolution, high altitude is the region of mountains that is sufficiently elevated above the surrounding lowlands to be characterised by significant climatic differences, different flora and fauna. Pronounced ecological differences and characteristic high altitude specializations appear among the mountain autochthonous insects in the so-called alpine zone that commences at elevations above 2000 - 2500 m only... The high altitude insects may thus be described as an ecologically highly specialized, mountain autochthonous group existing exclusively in the biom above the forest, at elevations above 2000 - 2500 m“.

The high altitude Isopods are inadequately studied. In his monograph of 527 pages. MANI (1968) has consecrated to Isopoda Oniscidea only 3 lines, saying: „Endogeous Isopoda have been collected at elevations of 4800 m on the Northwest Himalaya“. We also collected woodlice on similar altitude in Karakorum, but this material remains under study.

In Europe almost everywhere above 2200 m we can find the treeless oreotundral with its orophytic vegetation and specific climate. The environment in the in the other continents of the Old World is quite different. In the arid mountains of Central Asia dry mountain steppe is developed. In the Himalaya rhododendron forests flourish even at 4600 m. On the high mountains of Central and East Africa special „afromontane“ environment has created particularly favourable conditions for diversity of Eubelidae and other Isopods.

Nevertheless, an arbitrary lower limit should be selected for the review of the high mountain Isopods. The 2200 m, chosen by us, has real meaning only in Europe and a few other regions with similar conditions (Corea, Japan). In the other continents often forests grow on this altitude and thus we can hardly speak of high mountain environment. Some factors are however of universal importance (atmospheric pressure, solar and UV radiation etc.).

Taxonomically the high altitude Isopods of the Old World (taxa known at and above 2200 m or as an exception near to this altitude) belong to at



- 1** - fam. Ligiidae - up to 2200 m
- 2** - fam. Trichoniscidae - up to 2900 m
- 3** - fam. Mesoniscidae - up to 2150 m
- 4** - fam. Buddelundiellidae - up to 2600 m
- 5** - fam. Styloniscidae - up to 2333 m
- 6** - fam. Philosciidae - up to 4694 m
- 7** - fam. Trachelipodidae - up to 3200 m

- H** - fam. Porcellionidae - up to 4725 m
- I** - fam. Oniscidae - up to 2800 m
- J** - fam. Armadillidiidae - up to 2860 m
- K** - fam. Eubelidae - up to 4600 m
- L** - fam. Scleropactidae - up to 4200 m
- M** - fam. Armadillidae - up to 3850 m

Altitudinal Distribution of Isopoda Oniscidea living at and above 2200 m in the Old World

least 13 families, 60 genera and 132 species. More than half of the genera (36 or 60%) and the species (88 or 66%) are members of 3 families: Eubelidae (37 sp., 19 gen.), Porcellionidae (30 sp., 7 gen.) and Philosciidae (21 sp., 10 gen.). The highest recorded Isopoda terrestria (4 species known above 4500

Table 1
Altitudinal Distribution of Isopoda Oniscidea in the Mountains of the Old World

Families	Number of species													
	2151-2200 m	2201-2500 m	2501-3000 m	3001-3500 m	3501-4000 m	4001-4500 m	4501-4725 m							
Ligiidae	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichoniscidae	4	3	1	-	-	-	-	-	-	-	-	-	-	-
Mesoniscidae	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Styloniscidae	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Buddelundiellidae	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Philosciidae	12	11	7	3	2	1	1	1	1	1	1	1	1	1
Trachelipodidae	4	7	6	1	-	-	-	-	-	-	-	-	-	-
Porcellionidae	18	17	11	7	7	2	1	1	1	1	1	1	1	1
Oniscidae	4	3	3	-	-	-	-	-	-	-	-	-	-	-
Armadillidiidae	5	5	3	-	-	-	-	-	-	-	-	-	-	-
Eubelidae	13	19	26	9	4	2	2	2	2	2	2	2	2	2
Scleropactidae	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Armadillidae	15	16	11	6	2	-	-	-	-	-	-	-	-	-
Total	82	85	56	25	15	5	4	4	4	4	4	4	4	4

m) also belong to these families. Out of the remaining 10 families 8 (Ligiidae, Trichoniscidae, Mesoniscidae, Buddelundiellidae, Styloniscidae, Oniscidae, Armadillidiidae and Scleropactidae) don't reach the 3000 m, at least in the Old World. Both other families (Trachelipodidae and Armadillidae) reach in Nepal 3200 and 3850 m and include pronounced high altitude Isopods from the genera *Nagurus* and *Cubaris*. From the 10 high altitude Philosciidae genera particularly interesting is genus *Palaioscia* Vandel. The only species *P. alticola* Vandel has been collected by us (H. Dalens det.) up to the top of Mt Wilhelm (New Guinea, 4694 m). According to VANDEL (1972), this species is similar to *Proischioscia andina* Vandel, described from high Andes of Ecuador (3400 - 3800 m). True hypsobionts are probably some species of *Afrophiloscia* (*A. uncinata* Ferrara at 3700 m on Kilimandjaro). The other genera and species live high in the forest zone of Himalaya, Solomon Is. and African mountains. The champions are among the Porcellionidae, especially in the mountains of Asia. They are members of *Protracheoniscus* Verh. (*P. nivalis* Verh. up to 4725 m in Ladakh). However Isopods can reach 4800 m in the Himalaya (MANI, 1968 and our observations). Many species of genus *Porcellio* Latr. live in the high mountains of Europe, North Africa, Yemen and China. Especially the North African *Porcellio atlanteus* Verh. (4000 m) and *P. humberti* Paulian de Félice (3800 m) are certainly true hypsobionts.

The tropical family Eubelidae contains the biggest number of genera and species living in high mountains. Out of total of 39 genera in Eubelidae 19 include species known above 2200 m. The highest living are *Aethiopopactes* Verh. (4600 m on Kilimandjaro) and *Benechinus* Budde-Lund (also 4600 m on Meru), but also in the genera *Angaribia*, *Eubelum*, *Hiallelgon*, *Hiallum*, *Mesarmadillo*, *Periscyphis* and *Microcercus* there are species recorded from altitudes at or over 3500 m.

The 22 species of Isopoda Oniscidea in the Old World living at or above 3500 m

Isopoda Oniscidea indet.: 4800 m (Norhwest Himalaya)

Protracheoniscus nivalis Verh. (Porcellionidae) - 4725 m in Ladakh

Palaioscia alticola Vandel (Philosciidae) - 4694 m in Papua New Guinea

Aethiopopactes chenzemae Ferrara et Taiti (Eubelidae) - 4600 m on Kilimandjaro

Benechinus armatus Budde-Lund (Eubelidae) - 4600 m on Meru

Protracheoniscus sabaudus Arcangeli (Porcellionidae) - 4060 m in Karakorum

Mesarmadillo chappuisi Paulian de Félice (Eubelidae) - 4000 m on Elgon

Mesarmadillo arambourgi Paulian de Félice (Eubelidae) - 4000 m on Elgon

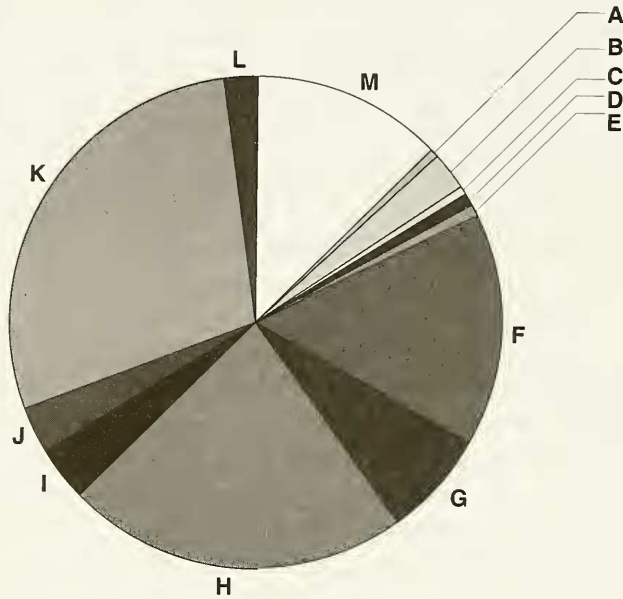
Hiallagon jeanneli Paulian de Félice (Eubelidae) - 4000 m on Elgon
Porcellio atlanteus Verhoeff (Porcellionidae) - 4000 m on Atlas
Protracheoniscus desioi Arc. (Porcellionidae) - 3900 m in Karakorum
Cubaris everesti Vandel (Armadillidae) - 3850 m in Nepal
Porcellio humberti Paulian de Félice (Porcellionidae) - 3800 m on Atlas
 „*Periscyphis*“ *montanus* Schmölzer (Eubelidae) - 3800 m on Mt Kenya
Afrophiloscia uncinata Ferrara (Philosciidae) - 3700 m on Kilimandjaro
Angaribia ? lobata Ferrara et Taiti (Eubelidae) - 3660 in Yemen
Porcellio yemenensis Barnard (Porcellionidae) - 3660 m in Yemen
Cubaris alticola Vandel (Armadillidae) - 3600 m in Nepal
 „*Porcellio*“ *spatulata* Barnard (Porcellionidae) - 3600 m in Ethiopia
Hiallum richardsoni Paulian de Félice (Eubelidae) - 3500 m on Elgon
Periscyphis ruficauda Budde-Lund (Eubelidae) - 3500 m on Mt. Kenya
Eubelum tachyoryctidis Paulian de Félice (Eubelidae) - 3500 m on Elgon
 „*Synarmadillo*“ *marmoratus* Budde-Lund (Armadillidae) - 3500 m on Meru

We can see from this list that the 22 species of highest altitude Isopods belong to 4 families: Eubelidae (10), Porcellionidae (7), Philosciidae (2) and Armadillidae (3). Only 6 of them have been described before 1940.

There are considerable differences between the high mountain Isopods of Europe, Asia and Africa. In the well explored Europe, where Eubelidae do not occur, terrestrial Isopods are rare above 2200 m (only 22 sp. of 10 genera - *Oritoniscus*, *Trichoniscus*, *Hyloniscus*, *Mesoniscus*, *Buddelundiella*, *Trachelipus*, *Metoponorthus*, *Porcellio*, *Oroniscus*, *Armadillidium* - and 7 families). In the Alps only 8 species have been recorded, the highest being *Oroniscus festai* Arc. at 2800 m (ARCANGELI, 1932; WÜRMLI, 1972; STROUHAL, 1948; STROUHAL & FRANZ, 1953; SCHMÖLZER, 1950, 1962). In Sierra Nevada they are 6, in the Pyrenees - 5, in some other mountains (Apennines, Olymp, Pirin, Vitosha, North Albanian Alps) - 1 in each. The highest known terrestrial Isopoda in Europe live in Sierra Nevada (*Porcellio violaceus* Budde-Lund at 3300 m, according to JANETSCHKE, 1957). In May 1993 we had the chance to observe in the North Albanian Alps (the top of Radohimës, 2569 m) a true swarming of hundreds of *Armadillidium albanicum* Verh. (St. Andreev det.). Nothing of this kind has ever been recorded for an European mountain. In Bulgaria on the same latitude Isopoda Oniscidea are extremely rare above 2500 m.

In the arid mountains from Atlas to Karakorum prevail xerophilic Isopoda like *Porcellio* Latr. (up to 4000 m in Atlas, 3660 m in Yemen) or *Protracheoniscus* Verh. (to the maximal height of 4725 m in Ladakh). We owe this information to ARCANGELI (1934), VERHOEFF (1936, 1937, 1938), BORUTZKY (1959), PAULIAN DE FÉLICE (1945), SCHMALFUSS (1986), BARNARD (1941) and others. Many articles have been published by Paulian de Félice, Ferrara and Schmalfluss on the Isopods of Cameroon, but they concern only lowland

species. The fauna of Mt. Cameroon higher than 3000 m is still unexplored, and the slopes of Mt. Fako (4090 m) are covered until 3000 m by tropical rain forest. From this altitude we know only the endemic genus and species *Fakoanum agauriae* Paulian de Félice. Many more are the species known from the well explored East and Central African mountains (Ruwenzori, Elgon, Mt. Kenya, Kilimandjaro, Aberdare, Uluguru etc.). These fascinating mountains



- | | |
|---------------------------------------|-------------------------------------|
| A - fam. Ligiidae - 1 | H - fam. Porcellionidae - 30 |
| B - fam. Trichoniscidae - 4 | I - fam. Oniscidae - 4 |
| C - fam. Mesoniscidae - 1 | J - fam. Armadillidiidae - 5 |
| D - fam. Buddelundiellidae - 1 | K - fam. Eubelidae - 37 |
| E - fam. Styloniscidae - 1 | L - fam. Scleropactidae - 3 |
| F - fam. Philosciidae - 21 | M - fam. Armadillidae - 16 |
| G - fam. Trachelipodidae - 9 | |

**Number of species of Isopoda Oniscidea
living at or above 2200 m in the Old World**

have seen many highly qualified expeditions, and at least 49 species of 27 genera and 5 families have been recorded by BUDDE-LUND (1898, 1910), LÖNNBERG & BUDDE-LUND (1912), FERRARA (1974, 1975), FERRARA & TAITI (1982, 1984a, 1985a), TAITI & FERRARA (1979, 1980, 1981), ARCANGELI (1950), SCHMÖLZER (1974), PAULIAN DE FÉLICE (1945, 1945a) and others above 2200 m. Out of the 22 species known in the Old World higher then 3500 m 11

live in East and Central Africa (9 Eubelidae, 1 Philosciidae and 1 Armadillidae). We can add also 4 species from the mountains of Ethiopia (up to 3455 m), published by BARNARD (1940) and SCOTT (1958, note by Vandel).

From the mountains of South Africa (maximal height 3660 m) we know *Barnardoscia demarcata* Barnard, living up to 2438 m (FERRARA & TAITI, 1985). Some 8 species have recorded from the Nyiuka Plateau (2300-2850 m) in Malawi by TAITI & FERRARA (1987).

Little is known about the Isopods of the vast Himalaya system. In the papers of VANDEL (1973a) and SCHMALFUSS (1983) we can find information about 9 species living above 2200 m. They belong to the families Philosciidae (*Rennelloscia*), Trachelipodidae (*Nagurus*), Porcellionidae (*Porcellionides*), Oniscidae (? *Exalloniscus*) and Armadillidae (*Cubaris*). May be some more species will join this list, but not too many - the very intense research during the last 20 years (J. Martens, H. Janetschek and others, also our own observations) shows that Isopoda terrestria are not numerous in high Himalaya. MANI (1968) has noted the presence at 4800 m (Northwest Himalaya) of Isopoda indet. - probably one of the highest records for the group.

One of the remarkable hypsobiont Isopods live, as we already noticed, in the mountains of New Guinea - we collected it at the top of Mt. Wilhelm (4694 m). The other „high altitude“ species, recorded in South India, S. China, Sumatra, Solomon Is. and Ceylon, cannot qualify for the noble cast of hypsobionts. They never go higher then 2500 m, and in this part of the World there are still forests at this altitude. One negative fact to be noticed is the complete absence (real or due to undercollecting?) of Isopoda Oniscidea in the mountains of Japan above 1600 m.

If we compare the high mountain Isopods of Europe and tropical Africa (South of Sahara), we can see that between the 24 sp. in Europe and 66 sp. in tropical Africa there are no species in common. From 10 genera in Europe and 35 in tropical Africa there are no genera in common either. Only 2 from the families living in Europe (7) and in Africa (5) higher then 2200 m are shared by the two continents (Porcellionidae and Oniscidae).

Little is known also on the ecology of the high altitude Isopoda, especially in the tropical mountains.

Isopoda Oniscidea in the Old World found higher than 2200 m and the highest known Isopoda Oniscidea in the World

Suborder ISOPODA ONISCIDEA - up to 4725 m (Ladakh), 4800 m (Himalaya, indet.)

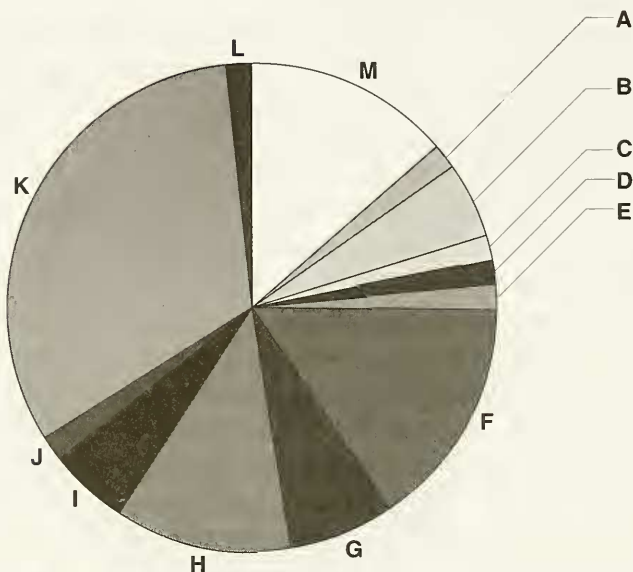
Fam. LIGIIDAE - up to 2200 m (China)

Ligidium Brandt - up to 2200 m (*L. denticulatum* Shen, Yunnan, S. China)

Fam. TRICHONISCIDAE - up to 2900 m (Pirin)

Oritoniscus Racovitza - up to 2500 m (*O. flavus* Budde - Lund, *O. despaxi* Vandel, Pyrenees)

Trichoniscus Brandt - up to 2200 m (*T. pusillus provisorius* Rac., Alps)



A - fam. Ligiidae - 1

B - fam. Trichoniscidae - 3

C - fam. Mesoniscidae - 1

D - fam. Buddelundiellidae - 1

E - fam. Styloniscidae - 1

F - fam. Philosciidae - 10

G - fam. Trachelipodidae - 4

H - fam. Porcellionidae - 7

I - fam. Oniscidae - 3

J - fam. Armadillidiidae - 1

K - fam. Eubelidae - 19

L - fam. Scleropactidae - 1

M - fam. Armadillidae - 8

**Number of genera of Isopoda Oniscidea
living at or above 2200 m in the Old World**

Hyloniscus Verhoeff - up to 2900 m (*H. riparius* C.L. Koch, Pirin)

Fam. MESONISCIDAE - up to 2150 m (Alps)

Mesoniscus Carl - up to 2150 m (*M. alpicola* Heller, Alps)

Fam. BUDELUNDIELLIDAE - up to 2600 m (Alps)

Buddelundiella Silvestri - up to 2600 m (*B. z. zimmeri* Verhoeff, Alps)

Fam. STYLONISCIDAE - up to 2333 m (Solomon Is.)

Indoniscus Vandel - up to 2333 m (*I. orientalis* Vandel, Solomon Is.)

Fam. PHILOSCIIDAE - up to 4694 m (New Guinea)

Afrophiloscia Taiti et Ferrara - up to 3700 m (*A. uncinata* Ferrara, Kilimandjaro; 2600 m, Meru), 3050 m (*A. rotundata* Taiti et Ferrara, Mt Kenya), 2750 m (*A. meruina* Ferrara et Taiti, Meru), 2500 m (*A. bispinosa* Ferrara et Taiti, Ngorongoro; 2250 m, Kilimandjaro), 2400 m (*A. tanzaniana* Ferrara et Taiti, Uluguru), 2300 m (*A. similis* Ferrara et Taiti, Oldeani)

Aphiloscia Budde-Lund - up to 2350 m (*A. montana* Taiti et Ferrara, Malawi)

Uluguroscia Taiti et Ferrara - up to 2600 m (*U. montana* Taiti et Ferrara, Uluguru)

Arcangeloscia Schmalfuss et Ferrara - up to 2300 m (*A. congolensis* Taiti et Ferrara, Kivu)

Palaioscia Vandel - up to 4694 m (*P. alticola* Vandel, Maunt Wilhelm, Papua New Guinea)

Rennelloscia Vandel - up to 2700 m (*R. martensi* Vandel, Nepal), 2600 m (*R. ferrarai* Schmalfuss, Nepal), 2330 m (*R. novabritannica* Vandel, Guadalcanal, Solomon Is.)

Burmoniscus Collinge - up to 2500 m (*B. ? rowei* Taiti et Manicasteri, Ceylon), 2300 m (*B. bartolozzii* Taiti et Manicasteri, Ceylon)

Pleopodoscia Verhoeff - up to 2700 m (*P. maculata* Schmölzer, Kilimandjaro), 2200 m (*P. oldongis* Schmölzer, Meru; *P. pallida* Schmölzer, Kilimandjaro)

Buddelundiscus Verhoeff - up to 2200 m (*B. maranguus* Schmölzer, Kilimandjaro; *B. marginatus* Schmölzer, Meru)

Barnardoscia Taiti et Ferrara - up to 2438 m (*B. demarcata* Barnard, Natal, South Africa)

Fam. TRACHELIPODIDAE - up to 3200 m (Nepal)

Lucasioides Kwon - up to 2400 m (*L. pedimaculatus* Kwon et Taiti, Yunnan, South China)

Nagurus Holthuis - up to 3200 m (*N. alticolus* Vandel, Nepal), 2700 m (*N. emarginatus* Arc., Karakorum, described as „*Nagara emarginata*“), 2550 m (*N. manangus* Schmalfuss, Nepal), 2500 m (*N. matekini* Borutzky, Terskey Alatau)

Porcellium Dahl - up to 2900 m (*P. recurvatum* Verhoeff, syn. *witoschicum* Verhoeff, Olymp; 2200 m, Vitosha)

Trachelipus Budde - Lund - up to 2800 m (*T. pieperi* Schmalfuss, Elburs), 2650 m (*T. azerbaijhanus* Schmalfuss, Iranian Azerbaidzhan), 2500 m (*T. ratzeburgi* Brandt, Alps)

Fam. PORCELLIONIDAE - up to 4725 m (Ladakh)

Desertoniscus Verhoeff - up to ? 2500 m (*D. subterraneus* Verhoeff, Terskey Alatau, Kirghizia)

Metoponorthus Budde - Lund - up to 3000 m (*M. asifensis* Verh., Atlas), 2800 m (*M. fuscomarmoratus* Budde - Lund, Sierra Nevada, Spain), 2500 m (*M. s. sexfasciatus* Budde - Lund, Sierra Nevada)

Porcellionides Myers - up to 3450 m (*P. pruinus* Brandt, Nepal)

Porcellio Latreille - up to 4000 m (*P. atlanteus* Verhoeff, Atlas, Marocco), 3800 m (*P. humberti* Paulian de Félice, Atlas, Marocco), 3660 m (*P. yemenensis* Barnard, Yemen), 3300 m (*P. violaceus* Budde - Lund, Sierra Nevada; *P. herculis* Verhoeff, Atlas, Marocco), 3000 m (*P. s. scaber* Latr., Sierra Nevada; *P. lepinyi* Verhoeff, Atlas, Marocco), 2800 m (*P. violaceus* Budde - Lund, f. *pyrenaeus*, Pyrenees), 2750 m (*P. vandeli* Verhoeff, Atlas, Marocco), 2600 m (*P. alticola* Vandel, Pyrenees; *P. montanus* Budde-Lund, Alps), 2500 m (*P. festai* Arc., Alps), 2400 m (*P. laevis* Latreille, Yunnan, China; *P. monticola* Lereboullet, Pyrenees), 2300 m (*P. pyrenaeus* Dollfus, Pyrenees), > 2100 m (*P. despaxi* Vandel, Pyrenees)

„*Porcellio*“ - up to ca. 3600 m („*P.*“ *spatulata* Barnard, Ethiopia, Chilalo), > 2400 m („*P.*“ *obtusiserra* Barnard, Ethiopia)

Protracheoniscus Verhoeff - up to 4725 m (*P. nivalis* Verhoeff, Ladakh), 4060 m (*P. sabaudus* Arc., Karakorum), 3900 m (*P. desioi* Arc., Karakorum), 3100 m (*P. vachellii* Arc., Karakorum), 2800 m (*P. anatolii terskeyensis* Borutzky, Terskey Alatau, Kirghizia), 2200 m (*P. stefanellii* Arc., Karakorum)

Thermocellio Verhoeff - up to 2200 m (*Th. kilimanjarensis* Schmölzer, Kilimandjaro)

Uramba Budde-Lund - up to 2500 m (*U. triangulifera* Budde-Lund, Kenya, Tanzania)

Fam. ONISCIDAE - up to 2800 m (Alps)

?*Exalloniscus* Stebbing - up to 2650 m (*E. nepalensis* Schmalfuss, Nepal)

Oroniscus Verhoeff - up to 2800 m (*O. festai* Arcangeli, Alps), 2450 m (*O. helveticus* Verhoeff, Alps)

?*Alloniscus* Dana - up to 2700 m („*A.*“ *simplex* Schmölzer, Aberdare, Kenya)

Fam. ARMADILLIDIIDAE - up to 2860 m (Sierra Nevada)

Armadillidium Brandt - up to 2860 m (*A. mateui* Vandel, Sierra Nevada, 2760 m, Bethic Cordillera), 2715 m (*A. vulgare* Latr., Tenerife), 2550 m (*A. albanicum* Verhoeff, Northalbanian Alps), 2500 m (*A. pictum* Brandt, Pyrenees), 2250 m (*A. furcatum* Budde - Lund, Appenines)

Fam. EUBELIDAE - up to 4600 m (Kilimandjaro)

- Angaribia* Barnard - up to 3660 m (*A. ? lobata* Ferrara et Taiti, Yemen), 2150 m (*A. flavicauda* Taiti et Ferrara, Malawi)
- Anchiphiloscia* Stebbing - up to 2300 m (*A. karongae* Stebbing, Malawi)
- Benechinus* Budde - Lund - up to 4600 m (*B. armatus* Budde - Lund, Meru; 2200 m, Kilimandjaro)
- Gelsana* Budde - Lund - up to 3000 m (*G. abnormis* Budde - Lund, Marakwet; 2400 m, Elgon)
- Eubelum* Budde - Lund - up to 3500 m (*E. tachyoryctidis* Paulian de Félice, Elgon), > 3300 m (*Eubelum* sp., pr. *ignavum* B.-L., Ethiopia, Tola), 3000 m (*E. brevantennatum* Schmölzer, Aberdare; *E. instrenuum* Budde - Lund, Marakwet, Kenya), > 2400 m (*E. ignavum* Budde-Lund, Ethiopia, Jem-Jem Forest)
- Gerutha* Budde-Lund - up to 3000 m (*G. pila* Budde-Lund, Ruwenzori)
- Hiallagon* Paulian de Félice - up to 4000 m (*H. jeanneli* Paulian de Félice, Elgon)
- Hiallum* Budde - Lund - up to 3500 m (*H. richardsoni* Paulian de Félice, Elgon), 3100 m (*H. hilgendorfi* Budde-Lund, Ruwenzori)
- Kenyoniscus* Schmölzer - up to 2800 m (*K. paradoxus* Schmölzer, Meru)
- Fakoanum* Paulian de Félice - up to 3000 m (*F. agauriae* Paulian de Félice, Cameroon)
- Mesarmadillo* Dollfus - up to 4000 m (*M. chappuisi* Paulian de Félice, *M. arambourgi* Paulian de Félice, Elgon), 2500 m (*M. giganteus* Paulian de Félice, Kenya, Kijabe Forest)
- Periscyphis* Gerstaecker - up to 3800 m („*P. montanus* Schmölzer, Mount Kenya, „above the upper forest limit“), 3500 m (*P. ruficauda* Budde - Lund, Mt Kenya; 3200 m, Kilimandjaro; 2500 m, Aberdare), 3100 m („*P. pallidus* Schmölzer, Aberdare, Kenya), 3000 m (*P. undulatus* Omer-Cooper, Meru; „*P. niger* Schmölzer, Kilimandjaro), 2400 m (*P. buettikeri* Taiti et Ferrara, Saudi Arabia), 2350 m (*P. arabica* Barnard, Saudi Arabia)
- Periscyphops* Hilgendorf - up to 2700 m (*P. brunneus* Schmölzer, Aberdare, Kenya), 2600 m (*P. minimus* Schmölzer, Meru)
- Rufuta* Taiti et Ferrara - up to 2600 m (*R. carusoi* Taiti et Ferrara, Uluguru, Tanzania)
- Stegosauroniscus* Schmölzer - up to 2600 m (*S. horridus* Schmölzer, Meru; 2200 m, Kilimandjaro)
- Aethiopopactes* Verhoeff - up to 4600 m (*Ae. chenzemae* Ferrara et Taiti, Kilimandjaro, Uluguru)
- Oropactes* Ferrara et Taiti - up to 2600 m (*O. novus* Ferrara et Taiti, *O. maculatus* Ferrara et Taiti, *O. pilosus* Ferrara et Taiti, Uluguru)
- Ignamba* Budde-Lund - up to 2350 m (*I. jocquei* Taiti et Ferrara, Malawi), 2300 m (*I. malawiensis* Taiti et Ferrara, Malawi)
- Microcercus* Budde-Lund - up to ca. 3455 m (*Microcercus* sp., Ethiopia,

Semien), > 2400 m (*M. abyssinicus* Barnard, Ethiopia, Jem-Jem Forest)

Fam. SCLEROPACTIDAE - up to 4200 m (Ecuador)

Adinda Budde - Lund - up to 2400 m (*A. palniensis* Ferrara, Meli et Taiti, *A. nilgiriensis* Ferrara, Meli et Taiti, India), 2200 m (*A. sumatrana* Ferrara, Meli et Taiti, Sumatra)

Fam. ARMADILLIDAE - up to 3850 m (Nepal)

Pseudodiploexochus Taiti et Ferrara - up to 2900 m (*P. leleupi* Taiti et Ferrara, Kivu), 2700 m (*P. lejeunei* Taiti et Ferrara, Kivu, Nyiragongo; *P. schmal-fussi* Taiti et Ferrara, Kivu, Nyiragongo), 2600 m (*P. bergeri* Taiti et Ferrara, Uluguru)

Bethalus Budde-Lund - up to 2850 m (*B. lineatus* Taiti et Ferrara, Malawi)

Barnardillo Arcangeli - up to 2350 m (*B. montanus* Taiti et Ferrara, Malawi)

Ctenorillo Verhoeff - up to 2300 m (*C. kenyensis* Schmölder, Kenya)

Cubaris Brandt - up to 3850 m (*C. everesti* Vandel, Nepal - ? = *C. alticola* Vandel), 3600 m (*C. alticola* Vandel, Nepal), 3100 m (*C. nepalensis* Vandel, Nepal), 2350 m (*C. africana* Taiti et Ferrara, Malawi)

Neodillo Dalens - up to 2300 m (*N. simplex* Dalens, Papua New Guinea)

Sphaerillo Dana - up to 3100 m (*S. montivagus* Verhoeff, China, 2280 m (*S. orientalis* Kwon et Taiti, Yunnan, S. China)

„*Synarmadillo* Dollfus“ - up to 3100 m („*S. pygmaeus* Budde-Lund, Ruwenzori), 2200 m („*S. marmoratus* Budde - Lund, Meru)

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Върху високотланните сухоземни изоподи (Crustacea: Isopoda Oniscidea) на Стария свят

Петър БЕРОН

(Резюме)

Сухоземните изоподи (Isopoda Oniscidea) са слабо представени във високотланната среда на Стария свят. Досега над 2200 m (или близо до тази височина) са установени най-малко 132 вида от 60 рода и 13 семейства. Три от тези семейства (Eubelidae с 19 рода и 37 вида, Porcellionidae със 7 рода и 29 вида и Philosciidae с 10 рода и 21 вида) съдържат 60% от родовете и 66% от видовете, установени над 2200 m. Към тези семейства спадат и „рекордьорите“ - четирите вида сухоземни изоподи, които единствено в Стария свят живеят над 4500 m. Това са *Protracheoniscus nivalis* Verh. (Porcellionidae) - до 4725 m в Лагак, *Palaioscia alticola* Vandel (Philosciidae) - до 4694 m в Нова Гвинея, *Aethiopopactes chenzemae* Ferrara et Taiti (Eubelidae) - до 4600 m на Килиманджаро и *Benechinus armatus* Budde-Lund - до 4600 m на Меру. Определената долна граница от 2200 m има реално значение само в Европа и малък брой зруци области, а в тропическите страни на тази височина се простират гори и така те не влизат в дефиницията на ореотундрала. Над 3500 m почти навсякъде преобладават условията на високотланната среда със специфичните ѝ климатични и зруци показатели. Над тази граница са установени 22 вида от семействата Eubelidae (10), Porcellionidae (7), Armadillidae (3) и Philosciidae (2).

В добре изследваната Европа, където не се среща сем. Eubelidae, над 2200 m са намерени само 24 вида от 10 рода и 7 семейства. Максимална височина (3300 m) достига *Porcellio violaceus* Budde-Lund в Сиера Невада. В аридните области от Атлас до Каракорум преобладават ксерофилните изоподи като *Porcellio* (до 4000 m в Атлас, до 3660 m в Йемен) или *Protracheoniscus* (до максималната височина от 4725 m в Лагак). В планините на Централна и Източна Африка са установени над 2200 m най-малко 49 вида от 27 рода и 5 семейства: Philosciidae, Armadillidae, Porcellionidae, Oniscidae и преди всичко Eubelidae, към което спадат 24 от видовете и 14 от родовете. Към тях можем да прибавим и 4 вида, съобщени от планините на Етиопия до 3455 m, и 8 вида от Малави (до 2850 m). В Хималаите гори и след старателните изследвания през последните години бяха съобщени само 9 високотланни вида (до 3850 m). Там неопределени изоподи са наблюдавани до 4800 m (MANI, 1968).

Особен интерес представлява намереният от нас на Маунт Вилхелм до 4694 m вид *Palaioscia alticola* Vandel (Philosciidae), който е родствен с южноамериканския *Proischioscia andina* Vandel, известен от Еквадор от подобна височина. За отбелязване е също, че в Япония сухоземни изоподи не са установени над 1600 m.

Между 24-те вида високотланни изоподи в Европа и 66-те вида в тропическа Африка (на юг от 20° СШ) няма нищо един общ вид. От 10-те рода в Европа и 35 рода в тропическа Африка също няма нищо един общ, а от 7-те семейства в Европа и 5 в тропическа Африка - само 2 са общи (Porcellionidae и Oniscidae).